STRETCHING THE NATION'S TIMBER

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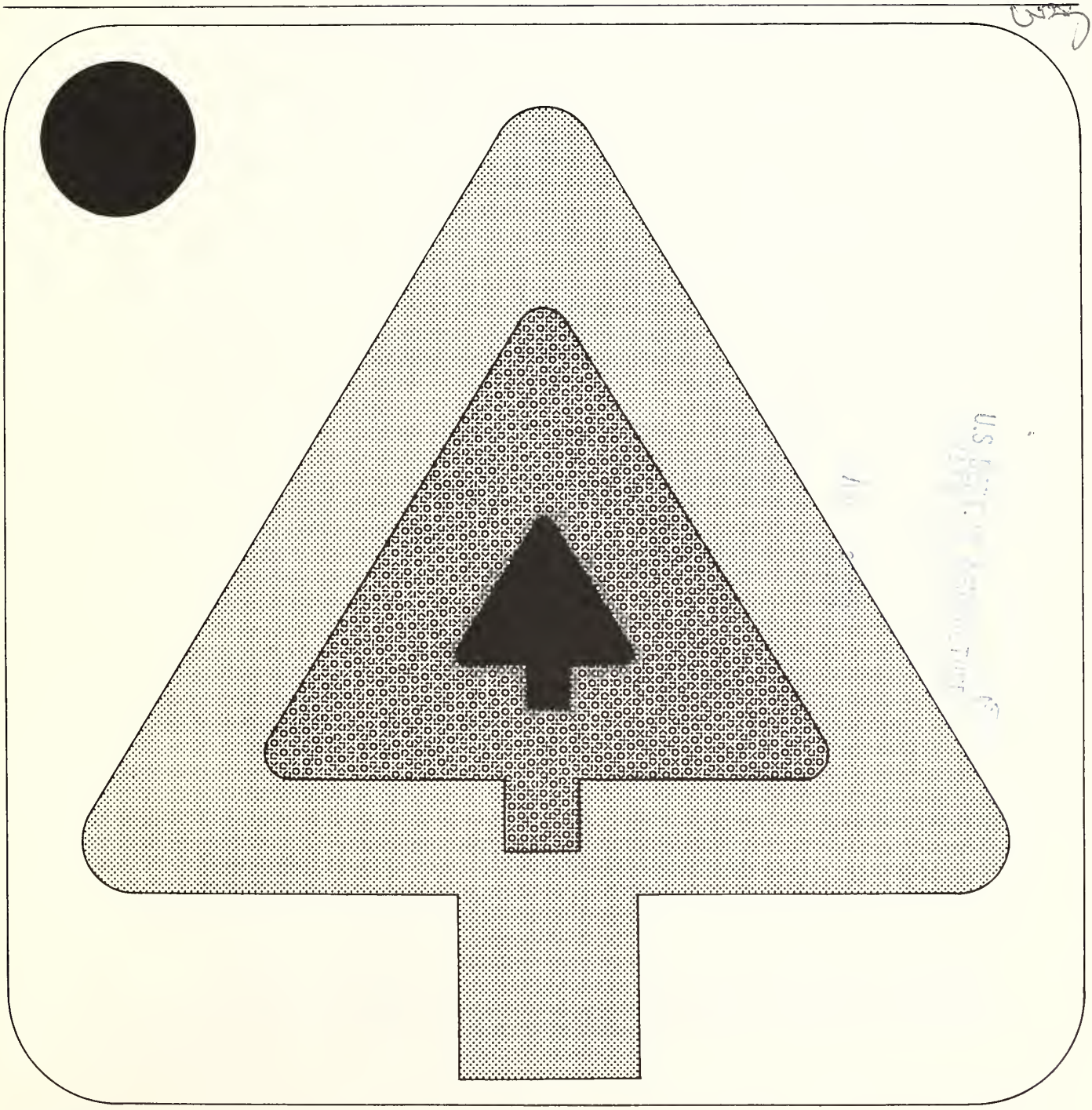

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STRETCHING THE NATION'S TIMBER

Introduction

Demand for lumber and other wood products is on the increase. By the year 2000, forest economists predict, the worldwide market for wood will be twice what it is today.

At the same time, the diverse activities of an expanding population are taking more and more lands out of timber production. This means that commercial forest managers must employ extraordinary efforts to increase--or even maintain--available timber supplies.

About 27 percent of the sawtimber produced in the U.S. comes from National Forest lands managed by the Forest Service, U.S. Department of Agriculture. Sixty percent of the commercial timber producing acreage is in non-industrial private holdings. As forestry oriented groups and timberland managers turn a calculating eye on America's woodpile, the Forest Service is directing special action and initiating intensified research studies towards increasing the timber resource.

Timber is a primary example of a renewable resource--renewable, that is, through an endless cycle of harvesting and replanting or natural regeneration. Thus, the responsibility for helping to fulfill our Nation's future commitments for wood supplies lies squarely in good forest protection and management--and efficient use of timber crops.

Such management will involve programs of reforestation, timber stand improvement and protection from wildfire, insects and disease. Elimination of waste on the forest floor and at the mill and adoption of harvesting and manufacturing techniques are keys to getting more usable products from every harvested tree.

Our Forest Land Base

Approximately one-third of America's land area is forested. Nearly two-thirds of this forested acreage is classified as commercial timberlands--lands adapted by soil, climate and location to grow merchantable crops of trees in perpetuity.

But this commercial forest area is shrinking. Between 1962 and 1970, commercial forest areas in the U.S. declined by some 8.5 million acres.

Many former timber tracts, both public and privately owned, have given way to recreation or real estate developments, highways, reservoirs or airports. In the last decade alone, many thousands of acres, once designated for timber harvest, have been set aside in response to constraints invoked by special interest groups seeking to protect recreational opportunities, wildlife, watershed, scenic vistas or the environment in general.

On public land, social and legal pressures to safeguard such values have stimulated modifications in timber harvesting practices. These either reduce the volumes removed or substantially increase the costs of timber harvesting. And, on privately owned lands, many areas rich in timber are being retained for non-timber uses such as summer residences, camps or retirement homes.

FS Survey Shows Deficit

An appraisal of the extent and condition of America's timber supply situation and outlook is published approximately every ten years by the Forest Service, U.S. Department of Agriculture. Statistics and projections in the most recent timber outlook report, The Outlook for Timber in the United States show that even though the Nation's timberland will be growing more wood in the year 2000 than they are producing today, their total output is not expected to meet anticipated demands. This projection is based on the assumption that 1970 price and management trends will continue.

The survey indicates that the deficit will be particularly acute in softwoods, which are used primarily in the manufacturing of 2 x 4's, plywood and the structural lumber needed for housing and industrial construction.

Demand for softwoods, including pulp, has risen some 65 percent over the last 30 years to a present annual total of 125 million tons. Use of industrial roundwood increased by 65 percent in this period to reach 13.7 billion cubic feet in 1972. Domestic softwood supplies are projected to increase about 54 billion board feet by the year 2000. Hardwood supplies are projected to increase to about 21 billion board feet in the same period. Both will fall far short of expected demand.

The Outlook for Timber in the United States, with its projections based on scientific survey of America's potential timber acreage, offers a clear warning that the Nation must seek all possible methods for offsetting predicted timber shortages.

Extending Timber Growth

Basically, the climate for commercial forestry in the United States has shown a marked improvement over the past few decades. Better prevention and control of forest fires, improved detection and control of forest insects and diseases, improved silvicultural techniques and increased tree planting have added substantially to the potential timber supply.

In the two decades preceding 1970, net annual timber growth in the U.S. increased by about 33 percent to a total of 10.7 billion cubic feet of softwoods and 7.9 billion cubic feet of hardwoods. Timber harvested from the Nation's forests also increased substantially to an annual average of 9.6 billion cubic feet of softwoods and 4.4 billion cubic feet of hardwoods. These increases came largely from regrowth of eastern forests and from more scientifically managed harvests of old-growth stands of timber in western National Forests.

Intensified forest management offers the most direct way of improving long-term timber supplies while maintaining an acceptable forest environment for other uses. New procedures, developed over the years in forestry research laboratories, have resulted in genetically improved planting stock and improved methods for forest fertilizing and for combating insects and diseases. On-the-ground application of this scientific technology contributes to intensified forestry management.

An example of applied scientific technology contributing to tree improvement is the "containerized" seedling project. Scientists at the Rocky Mountain Forest & Range Experiment Station research project at Bottineau, N. Dak., have refined techniques to grow tree seedlings in plastic containers in greenhouses. Through use of the technique, the tree-seedlings are ready for out planting in one-fifth the time normally required.

Full application of such intensified forestry methods on National Forest lands which supply 27 percent of the Nation's sawtimber, could increase by some 3.2 billion board feet the amount of timber annually available for harvest. Even greater increases in the non-industrial private land production are possible.

In fact, the greatest potential for increased timber production lies in the 296 million acres of forest lands held by non-industrial private owners, about 60 percent of the Nation's commercial timberland. In general, these lands are not being managed so they will produce to their greatest capacity. Often such woodlots lie idle with old growth timber or are poorly stocked when they could be producing young healthy stands of trees for the future. These forests presently produce an average wood growth per acre of only 36 cubic feet per year--considerably less than half their potential.

One of the problems is that most small private owners do not have the capital necessary to make long-term forest investments. Therefore, in 1973 Congress authorized the Forestry Incentives Program which provides federal cost sharing assistance to private landowners for tree planting and timber stand improvement. As part of this program, the Forest Service works through State Foresters to furnish technical assistance. There is an enormous contribution to meet future needs for wood.

However, intensified forestry alone cannot close the gap between timber supply and demand in the year 2000. Also needed is intensive application of improved timber harvest practices, including innovative methods of logging and timber retrieval, and close utilization of logs and residues at the mills.

Logging in Fragile Terrain

Harvesting timber in environmentally sensitive areas is a managed problem in much of the Pacific Northwest and the Rocky Mountain regions. Special techniques must be employed for reaching areas of unstable soils where extensive road-building cannot be tolerated and conventional harvesting methods are incompatible.

Research studies in these critical areas indicate that the timber stands are generally old-growth Douglas fir, with associated species, or lodgepole pine. Such stands have a high incidence of decay, are typically infected with mistletoe and show other signs of serious timber decadence. The removal of these stands and their replacement with vigorous young trees is a desirable silvicultural objective. Removal by harvesting results in utilization of the existing timber crop as well as preparing the way for more effective use of the site in producing future crops.

A major objective of experimental timber sale currently conducted in environmentally sensitive areas is to demonstrate that such areas can be harvested without undue damage to the soil, aesthetic values or the basic resource. Special emphasis is given to protecting and even enhancing the visual resource. Residue and hazard reduction measures are included in

the logging plan. Hand piling and burning for fuel breaks, bunching residues with a helicopter and then burning the piles, and broadcast burning are used when material is not marketable. Combining different residue and fuel treatments gives greater flexibility in meeting smoke management and other resource impact considerations.

Three logging systems effectively being used in steep or sensitive areas are the skyline cable system, balloon logging and helicopter logging.

The skyline cable was first used many years ago by pioneer lumbermen. Envionmentally-minded timber harvesters are now rediscovering its versatility. For this system, logs are yarded with the help of a system of cables supported atop a 100-foot spar and leading out to the various sectors of the logged area. Powered by diesel engines, the cable system drags in the logs, usually completely clear off the ground.

Balloon logging is essentially a cable system--using the balloon in place of the 100-foot spar. The balloon can lift a 14,500-pound load at 3,500-foot elevation. A cable connecting the balloon to the yarder pulls the balloon down toward the ground on the landing, where logs are loaded on trucks. During the past five years, some 50 to 75 million board feet of timber annually have been logged from National Forests by balloon.

Helicopter logging, also in effect on National Forest timber sales for about five years, is fastest but costliest of the three methods. For this method, logging crews must buck logs into lengths conforming to the helicopter's weight-lifting limits. The logs are hooked together with chokers to make loads for the big S-64 Skycrane of up to 17,000 pounds and are lifted at elevations of up to 5,000 feet. Chokers are fastened to an electrically-operated mechanical hook attached to a 150 to 300-foot cable affixed to the helicopter. Some 100 million board feet of timber annually are logged by helicopter or National Forests.

An estimated 50 million acres of commercial forest lands in the United States require special logging methods such as the balloons, helicopters or skyline systems. These are areas considered inaccessible with conventional roading and logging systems because of steep terrain, fragile soils, or other factors.

An outstanding advantage of these sky-logging methods is the saving they afford in timber access road building. With roads and skid trails sharply reduced, erosion of soils and damage to stream beds and to the landscape are minimized.

Then, too, logs harvested by advanced skyline methods are less subject to damage in transit to the yarding area. Harvest by these methods helps safeguard future timber crops, while avoiding damage to other resources in a thriving forest. Without the use of such methods and special equipment, much valuable wood could not be harvested and efficiently brought to the mill.

Improved Use of Equipment

Other wood utilization benefits can be realized through the use of new specialized equipment or by innovative redesigning of standard logging equipment such as skidders, tractors and loaders. Two examples of specialized heavy equipment that are helping in a fuller and more efficient recovery of useable wood are an agile log stacker and an all-purpose timber "combine."

The stacker is a unit with front-end arms that can unload trucks in one "bite" and can sort and stack logs in decks, thus eliminating the need for log ponds or water dumps used by many mills. Ponding operations are not only messy, but often result in loss of logs that sink to the bottom of the pond. Also, bark and debris accumulate in the water with undesirable environmental effects. Using the stacker, logs may be handled efficiently on dry land with any accumulated debris disposed of as boiler fuel.

The timber "combine" snips off trees close to the ground with hydraulically-operated shears; delimbs them and sections them into log lengths. This practice in itself can add many more tons of wood to the timber harvest and reduce wasteful and unsightly stumps. Also, special root-pulling equipment has been devised which can remove stump sections of even long-rooted southern pines, thus adding still more volume to pulpwood harvest.

Utilization of Logging Residues

Disposing of slash and other forest residues is an important aftermath to timber operations. How and when this is done affects all subsequent forest management functions and influences environmental and social considerations. The degree to which residues are utilized or disposed of affects wildlife behavior, quality of wildlife habitat, kinds of recreation use and aesthetic appeal of forest areas.

From the silvicultural standpoint, the volume and disposition of logging residues can determine the ease or difficulty of tree planting, thinning work and cultural operations. In Douglas fir country, heavy slash accumulations may handicap planting crews and their equipment. Extensive accumulations of slash occupy valuable ground needed for seedlings. They also constitute a severe fire hazard.

Slash generally consists of tree limbs, foliage, top wood, roots and stumps. It may also include whole trees, standing or down, that are defective, too small, deformed or otherwise of non-merchantable quality.

How big is this slash pile? Forest Service researchers have estimated that timber sales in the National Forests create an average of 1.2 million acres of slash each year. In 1970, logging residues in the total United States were almost 1.6 billion cubic feet of which 73 percent was in softwood. Largest concentrations are in the West, with almost 600 million cubic feet of residues. In western Oregon and Washington alone, logging residues in 1970 reached 331 million cubic feet--more than one-third of the total softwood residues in the United States. Recent studies of cut-over areas in old-growth Douglas fir forests show an average gross volume of more than 7,400 cubic feet per acre of slash, exceeding four inches in diameter. In southwestern forests, residues may comprise as much as 20 percent of the total cubic foot harvested volume.

Three Forest Service experiment stations in the West have undertaken a study of the all-pervasive problem of forest residues and how best to deal with them. Complementary studies are simultaneously underway at the Forest Products Laboratory in Madison, Wis., and engineers in the Forest Service's San Dimas Equipment Development Center in California are working to design tools and equipment needed in residue utilization.

In moderate amounts, some timber residues may be beneficial, adding nutrients to the soil, protecting seedlings, providing cover for wildlife and preventing erosion. However logging residues in excessive quantities left on the ground are an eyesore and a potential fire hazard.

Where market outlets exist for small-sized wood, such as particleboard or pulp, logged areas may yield appreciable value. National Forest timber sales often require operators to collect this "small" wood in on-site concentration centers, thus encouraging closer utilization.

Many States have regulations requiring the timber operator to abate logging slash to the satisfaction of the State Forester. State fire laws define volume, size and distribution of slash to meet local standards for slash abatement. The operator must meet specified standards in order to pass official inspection. Where slash has an economic outlet, its use for this purpose will help clean up debris and meet requirements of the State laws.

Chipping Residues

Until quite recently, chipping low-value timber at the harvest site to be used as raw material for the mills was considered an uneconomic way to make use of logging residues. The product value of chips delivered to the fiber utilization plant was generally not enough to justify investment in specialized logging and chipping equipment and transportation. And, since most old-style mills could only utilize bark-free wood, it was frequently necessary for chipping equipment to include costly machinery for removing bark.

As a result, most woods chipping was confined to the amounts needed for environmental reasons such as the elimination of aesthetic eyesores, intensive roadside cleanup, or special hazard reduction, and was generally subsidized from public funds. Often chips produced were left on the site as mulch, cover for wildlife, or as an aid in protecting against soil erosion.

However, recent technological developments in the fiber-using industries--including pulp mills, particleboard plants and allied industries--now permit mixing hardwood and softwood chips and bark, and using the blended input as raw material for certain grades of pulp.

With chipping becoming more feasible, scientists in Forest Service experiment stations are devising new ways to make use of these logging and mill leftovers. The Forest Products Laboratory has joined the effort with evaluation studies on the use of chips in making paper, particleboard, mulch or special products. The Laboratory is studying residues from both western softwoods and northern hardwoods and is also looking for ways to utilize rough chips--those with bark attached.

At Forest Service equipment and development centers, engineers are studying use of high-pressure water jets to chip and clean slash. Research has been stimulated by the development of a wide variety of commercial chipping and debarking equipment that makes chipping in the woods a practical operation.

Chipping units may be whole-tree chippers that consume foliage, branches and heavy limbs and produce chips mixed with bark and other debris; or they may be equipped with barkers so that clean wood is produced.

Many chipping machines are mobile and quickly set up for action. When teamed with harvesting equipment, they can be fed enough raw material to make on-the-site chipping production profitable. For removal and transportation, chips may be blown directly into a van to be hauled to the mill.

At the Forest Service's Intermountain Forest Experiment Station, research is underway on a wood-chip pipeline for transporting large volumes of chips and other small, low-valued forest products over long distances. A study of the economic feasibility of such transport, conducted in the 1960's as a cooperative aid project between the Forest Engineering Research Branch of the Intermountain Station and the Civil Engineering Department of Montana State University at Bozeman, reported that "the Nation's largest producers of pulp, paper and other fiber products are interested in the prospect of moving 500 to 5,000 tons of wood chips per day to a processing center by pipeline."

Stretching Wood Supplies at the Mill

Forest economists estimate that nearly one-third of all timber harvested from commercial forests in the United States is still being wasted. A Forest Service project known as "STRETCH" aims at helping to close this gap.

STRETCH is a coordinated cooperative program for the development of methods to increase timber recovery and for devising additional economic outlets for the raw material incidental to the manufacture of timber products. Contributing to STRETCH's goals are various techniques developed on a work-study basis by Forest Service scientists. These include utilization of computerized sawmilling, thinner saw blades and generally improved dry kiln management methods. At the Forest Products Laboratory, scientists have manufactured structural particleboard from forest residues.

Up to 15-20 percent more lumber from small logs is recovered through a computer programmed method of log breakdown. Using the diameter of each log as a base, the computer determines the precise width and position of the initial headsaw cut so as to yield the greatest amount of lumber from each log with a minimum of waste. This program is called "B.O.F." for Best Opening Face. Selection of this "best opening face" offers a practical and effective way of appreciably increasing wood recovery.

Another computer-controlled program, developed by equipment specialists at the Forest Products Laboratory, will predict cutting yields from various grades of hardwood lumber. An ultrasonic scanner sends sound waves through the board to determine where the knots are and then transmits this information to a computer. The computer makes an electronic picture of the board, decides the best way to get most furniture cuttings from it, and then directs the sawing of the board. Laboratory tests on 1,000 boards show the computer averages about 300 times the speed of man, with an average of only four mistakes to man's 20.

In still another STRETCH project, developed at the Forest Products Laboratory, small wood pieces are edgeglued into wide panels, then machine-ripped to produce standard width material. Special glues developed at the Laboratory are used in this project. Edgegluing techniques make it possible to produce wide-dimension boards of high quality from small-diameter logs.

A practical application of the STRETCH technique for using once-wasted, low-quality timber residues for construction lumber forms the basis for a new project, still in the pilot stage, known as COM-PLY. Sturdy 2 x 4 studs are made from bark and ground-up particles of waste wood, faced on the outside with solid wood from the strong outer portion of the tree. COM-PLY is a cooperative research endeavor of the Forest Service, Southeastern Experiment Station; the Department of Housing and Urban Development, and the American Plywood Association. Through this ingenious technique, usable wood from each log is doubled.

Allied with programs to stretch the marketable supply of timber from each tree harvested are ongoing programs aimed at extending the quality and durability of processed lumber.

As any wood-user knows, proper drying can make all the difference in quality of finished lumber. For over half a century, the Forest Products Laboratory has been conducting annual week-long kiln drying demonstrations each spring, open to any professional wood user interested in learning techniques in wood drying and handling.

Grade and footage losses caused by drying defects amount to hundreds of millions of dollars annually. Improved drying operations, as demonstrated at the dry kiln clinics, can not only save grade and footage but also reduce overall drying costs by increasing the output of stock dried to quality moisture content in a shorter time.

Meantime, research scientists at the Forest Products Laboratory have pioneered techniques, now accepted and used throughout the world, for extending the durability of processed lumber through use of preservatives. They have also devised techniques to guarantee protection from termite infestation--including both construction techniques and chemical treatment of wood and soils around construction sites.

Sawmill Assistance Program

As part of a continuing effort to help stretch the Nation's timber supply by getting research findings to the people who will use them, the Forest Service recently began an intensified sawmill assistance program. Under this program of State and private forestry, teams of Forest Service and State Forestry sawmill analysis specialists provide technical help for private mill owners.

The Sawmill Improvement Program is designed to help sawmill operators increase their lumber recovery and conservation efficiency on an individual basis. Mill owners wishing assistance may apply for participation in the program to the Forest Service or their State Foresters.

This service to the small mill owner incorporates a computer program that analyzes mill data to determine present and potential lumber recovery. For example, data obtained from participating mills analyzed over a 12-month period shows that specific improvements in bucking and sawing lumber can increase output by approximately 13 percent. In addition, use of computerized (Best Opening Face) sawing and other improved mill techniques, showed a potential increase in lumber recovery of about 36 percent at most mills analyzed.

Improved Harvesting Program

Another cooperative assistance program, aimed at putting additional timber on the market through better harvesting, handling and selling techniques, is the new Improved Harvesting Program. Initiated by the Forest Service's State and Private arm, this program not only helps the private forest landowner but also encompasses public forest lands. It even provides assistance to National Forests, upon request, and to loggers and haulers operating on National Forest timber.

Many acres on non-industrial, privately-owned forest land in the United States are not scientifically managed for timber production, sometimes because of the small size and unconventional location of the tract and sometimes also because of lack of landowner interest or knowledge of harvesting methods. The Improved Harvesting Program helps and encourages the landowner to fully manage his lands, thus making needed timber available for market and increasing timber growth per acre for future marketing, through careful harvesting.

Technical help in felling and bucking procedures is provided under the Improved Harvesting Program, with direct, on-the-ground computer-guided assistance. In another phase of the program, landowners are encouraged to plan their timber harvesting for sales encompassing a wide range of purposes--rather than logging for a single product such as pulpwood or sawtimber. Still another phase encourages full timber salvage of salvable dead or cull timber.

A final phase of the Improved Harvesting Program provides for utilization of recoverable wood from urban areas. Waste material from municipal removals of dead, dying or otherwise expendable trees for land clearing, road and building construction, can cause a serious impact on the environment. Many large urban areas throughout the Nation have a high potential for wood products recovery from trees otherwise buried or burned. Under technical supervision of utilization foresters, State forestry employees or private foresters working under contract with the State will work in urban areas to coordinate and develop uses relevant to the particular area from the fragmented "cull" wood sources. One recommendation is for establishment of chipping stations to operate in selected locations of metropolitan areas.

Summary

Forest Service programs to make available the optimum quantity and quality of timber to meet mounting needs of the U.S. public now and in the future require the cooperative efforts of all three sectors--Research, State and Private Forestry, and National Forest Systems. As we have shown, this is a continuous task, and one of steadily increasing importance. Even as this is written, new studies for one phase or another of improving close timber utilization are underway; new techniques are being developed; new programs for expanding the endeavors are being effected.

QUESTIONS AND ANSWERS

Q: If U.S. timber supplies are falling short of public demand, why not recommend substitution of alternate materials for building and other uses?

A: First, substitution will not be necessary if we develop the technology to use more that is grown. That's what close timber utilization is all about. Secondly, the use of wood is encouraged instead of substitutes such as brick, minerals, or non-wood synthetics because wood is the only truly renewable "raw material" resource. When minerals are taken from the ground they are not renewed. In addition, their manufacture takes much more energy than does the manufacture of timber into wood products.

Q: Do Forest Service timber sale contracts contain any provisions for restoration of the timber tract after harvest?

A: Yes. Contracts contain provisions for such environmental considerations as erosion control, brush disposal and reforestation. Cost allowances in timber sale appraisals and contracts provide the funding to do work such as plant new trees, if needed, and reduce the fire hazard. Work may be either done by the purchaser or cooperatively by the Forest Service.

Q: Does standing dead or damaged timber have real economic value as a potential wood source?

A: Dead and damaged timber can usually be used for paper, particleboard, and chemicals derived from wood. The economy of using dead and damaged trees depends on how much it costs to harvest the material and what the market for the products is like. It has already been done profitably in many cases, and much more is expected.

Q: Commercial timber firms have traditionally figured on taking from the forest an average of 50 percent of each tree felled. Can the whole tree be used?

A: Whole-tree harvesting and processing can be practical with new harvesting systems. This relatively new practice can result in one and a half times as much yield if tree parts down to 1 inch in diameter are harvested.

Q: Since net growth of hardwoods in the U.S. is considerably higher than the volume of hardwoods commercially used, why aren't more products made from these available hardwoods.

A: Much of the hardwood resource that is not used is either unsuitable for some products, or requires relatively expensive processing to make it into commercial products. On-going research is leading to ways to make hardwoods more suitable for many products and less costly to process. Results of this research will provide know-how to make more products from hardwoods.

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